International Journal of Zoology
and Research (IJZR)
ISSN (P): 2278-8816; ISSN (E): 2278-8824
Vol. 8, Issue 4, Dec 2018, 1-6

AN EFFECT OF DIETARY SUPPLEMENTATION OF *CHLORELLA VULGARIS*(GREEN MICROALGAE) ON EGG PRODUCTION OF JAPANESE QUAIL

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ABSTRACT

The present study was designed to evaluate the laying performance of Japanese quail fed Chlorella vulgaris algae containing diets. An experimental diet containing 5 levels of Chlorella vulgaris powder (0.0, 0.5, 1.0, 2.0 and 4.0%) from 6 to 13 weeks of age. A total number of 120 female quails were randomly divided into five dietary treatments (3 replicates of 24 birds per treatment) and reared under cage system. These existed significant improvement in egg production at 5 g C. vulgaris per kg of feed. In egg laying quails, C. vulgaris supplemented feed intake in 6-13 weeks of age at 5 g per kg of feed was found to improve egg production.

KEYWORD: Egg Weight & FCR

Received: Oct 01, 2018; **Accepted:** Nov 21, 2018; **Published:** Dec 17, 2018; **Paper Id:** IJZRDEC20181

Original Article

INDRODUCTION

The Japanese quail, also known as *Coturnix quail (Coturnix japonica*) is a species of Old World quail found in East Asia. Commercial production of J.quail started in Japan and then in America, Europe and the Middle East during 1930-1950. In 1974 the Japanese quails were brought to Central Avian Research Institute, Izatnagar, India and were subsequently brought to Tamil Nadu during 1984 (Asha, 2011). Females start laying eggs at about 6-7 weeks of age, and are usually in peak egg production by 11-12 week of age and are generally reared up to 10-12 months of age for breeding. During this period, each female lays about 250-270 eggs, each egg weighing 12-13 g (Asha, 2011). Life expectancy is 2 to 2½ year. Microalgae are an enormous biological resource, representing one of the most promising sources for new products and applications (Pulz and Gross, 2004). They can be used to enhance the nutritional value of food and animal feed, due to their well balanced chemical composition.

MATERIALS AND METHODS

The biological experiment was carried out in the Poultry farm complex, Department of Poultry Science, Veterinary College and Research Institute (VCRI), Namakkal, Tamilnadu Veterinary and Animal Sciences University (TANUVAS). To study the effect of dietary supplementation of green microalgae (*Chlorella vulgaris*) on laying performance and egg quality characteristics of Japanese quail (*Coturnix coturnix japonica*). The green micro algae, *Chlorella vulgaris* in dried form used in this study was procured from the National Institute of Ocean Technology (NIOT), Pallikaranai, Chennai.

Experimental Design and Allocation of Quails

In this experiment, 24 female birds were randomly selected from each treatment group and were reared under cage system to study the effect of feeding *Chlorell*a *vulgaris* on laying performance from 6 to 13 weeks of age. The experimental design consisted of five treatment groups with three replicates of 8 female quails each. The quails (from day old to thirteen week of age) were fed with experimental diets by incorporating 0, 0.5, 1.0, 2.0 and 4.0 percent *Chlorella vulgaris* algae.

EXPERIMENTAL DESIGN

Table 1

Treatment	Number of Replicate	Number of J.Quail		*Chlorella Vulgaris* (G Per Kg of Feed%)
		Per Replicate	Per Treatment	
T1 (control)	3	8	24	Nil
T2	3	8	24	5 / 0.5
T3	3	8	24	10 / 1
T4	3	8	24	20 / 2
T5	3	8	24	40 / 4

A uniform medication and standard management practices were followed for all experimental groups throughout the experimental period of 6 to 13 weeks of age. The quails were fed with a weighed quantity of experimental feed *ad libitum* and they had free access to potable water. Sixteen hours total light (photoperiod) was provided daily throughout the experimental period.

Laying Performance Studies

The productive performance of quail was evaluated as change in body weight, egg production rate, Hen Day Egg Production (HDEP), Egg weight, Feed consumption, Feed conversion ratio per dozen egg throughout 7-day period basis.

Statistical Analysis

The data collected in all the above biological experiments of this study were subjected to analysis of variance procedure of the Statistical Analysis System (SPSS version 20). When significant differences were noticed, the Duncan multiple range test was used to separate its mean values.

RESULTS AND DISCUSSIONS

Hen Day Egg Production

Hen day egg production of Japanese quails fed diets containing *C. Vulgaris* at 0.0, 0.5, 1.0, 2.0 or 4.0 percent level from sixth week of age to the thirteenth week of age has resulted in significant differences ($P < 0.05$) from seventh to tenth week of age and thereafter no significant difference was observed in the present study (Table 1). Supplementation of *C. vulgaris* to Japanese quails at 0.5 per cent level increased HDEP significant ($P < 0.05$) than at 1.0, 2.0 or 4.0 per cent and also with the control. Increasing the algae level has resulted in decrease of HDEP. The overall HDEP clearly indicated that 0.5 per cent *C. vulgaris* fed quails laid significantly ($P < 0.05$) more eggs than 1.0 or 4.0 per cent level. Similar results were obtained in laying hens by Zheng *et al.* (2012), Kim (2011), Halle *et al.* (2009), Svetlana Grigorova (2005), Arakawa *et al.* (1960), Mariey *et al.* (2012), Sakaida Takashi (2003), Abril *et al.* (2000) and Anonym, (1998). However, egg production in *Spirulina* fed quails did not differ from control (Ross and Dominy, 1990). No significant difference in egg

number was observed by Bianka Lipsteina *et al.* (2007) in laying hens fed with *C. vulgaris* and DL methionine. Similar observation with *Astaxanthin* in laying hens was reported by Yang *et al.* (2006), Lorenz (1999) and Ross *et al.* (1994). They also reported that there was no adverse effect on egg production in poultry fed *Spirulina*.

Egg Weight

The egg weight of Japanese quails fed diets containing *Chlorella vulgaris* did not show any difference when compared with the control both at the tenth and thirteenth week of age. No earlier research work was available to compare or discuss about Japanese quail egg weight. Similar results pertaining to egg weight were reported in chicken by Svetlana Grigorova (2005) and Yang *et al.* (2006).

Feed Consumption

The feed consumption per J. quails per day during the laying period was significantly ($P < 0.05$) reduced by dietary supplementation of *C. vulgaris* at all treatment levels than control (Table 3). Decreased feed intake in laying hens was observed by Halle *et al.*, (2009) but no significant difference in feed consumption by laying hens by feeding *C. vulgaris* was reported by Zheng *et al.*, (2012).

Feed Conversion Ratio per Dozen Eggs

Feed efficiency per dozen eggs and per kg of mass were significantly ($P < 0.05$) better in 0.5 per cent *C. vulgaris* algae fed quails (Table 3). Upto 1.0 per cent level the feed efficiency was better than control and by 2.0 or 4.0 per cent level. Increasing the algae dose more than 0.5 per cent to 1.0, 2.0 or 4.0 per cent had gradually reduced the feed efficiency by laying per dozen eggs. *C. vulgaris* with DL methionine supplementation also produced no significant effect on FCR in laying hens. Similar result was reported in laying hens by Lorenz (1999) and Ross *et al.* (1994). Decreased FCR was in agreement with Mariey *et al.* (2012) in laying hens. In conclusion, taking the economical aspect into account, *Chlorella vulgaris* could be safely used in Japanese quail diets, at a level of 0.5%, with superior effects on their productive performance.

Table 2: Effect of Dietary Supplementation of *Chlorella Vulgaris* (Green Microalgae) in Japanese Quail on Hen Day Egg Production (% HDEP, Mean ± SE)

Treatment/ % HDEP	*Chlorella Vulgaris* (%)				
	Control	0.5	1.0	2.0	4.0
Sixth week	8.33±5.51	18.06±3.67	5.56±3.67	8.33±4.17	4.17±4.17
Seventh week*	20.83^{a}±9.24	47.02^{b}±2.3	20.83^{a}±3.90	16.07^{a}±5.15	13.69^{a}±3.31
Eighth week*	42.85^{a}±13.95	66.67^{b}±5.9	34.52^{a}±2.15	37.50^{a}±1.03	28.57^{a}±2.06
Ninth week*	63.09^{ab}±8.89	67.26^{b}±6.04	42.26^{ab}±2.15	52.38^{ab}±15.09	33.93^{a}±8.18
Tenth week*	60.12^{ab}±10.73	70.24^{b}±6.86	54.76^{ab}±7.59	55.95^{ab}±11.72	33.33^{a}±6.04
Eleventh week ^{NS}	73.21±10.71	86.31±9.24	66.07±11.48	79.76±8.89	60.71±3.09
Twelfth Week ^{NS}	76.79±14.32	89.29±8.05	76.19±11.36	85.71±6.76	76.79±3.09
Thirteenth week ^{NS}	79.17±10.12	94.05±0.68	73.81±10.17	91.67±3.90	81.55±7.24
Overall Mean Up to 13^{th} week*	58.48^{ab}±10.02	71.97^{b}±4.96	50.28^{a}±4.41	58.30^{ab}±6.19	46.76^{a}±1.28

^{NS} Non Significant

* Significant ($P < 0.05$)

Values bearing same superscripts in the same row do not differ significantly

Table 3: Effect of Dietary Supplementation of *Chlorella Vulgaris* (Green Microalgae) in Japanese Quail on Egg Weight, Feed Consumption Per Quail Per Day, Feed Efficiency Per Dozen Eggs and Feed Efficiency Per Kg Egg Mass (Mean ± SE)

Treatment/ Egg weight[NS] (g)	*Chlorella Vulgaris* (%)				
	Control	0.5	1.0	2.0	4.0
	12.65±0.19	12.31±0.16	12.56±0.32	12.36 ±0.19	12.35±0.05
Feed consumption per bird per day during laying*(g)	31.54^{b}±0.29	30.39^{a}±0.18	30.02^{a}±0.25	30.56^{a} ±0.21	30.45^{a}±0.36
Feed efficiency per dozen eggs*	1.26^{ab}±0.31	0.76^{a}±0.04	1.15^{ab}±0.16	1.38^{ab}±0.37	1.69^{b}±0.34
Feed efficiency per kg egg mass*	6.34^{ab}±1.57	4.21^{a}±0.25	6.76^{ab}±0.66	6.83^{ab}±0.83	10.00^{b}±1.88

[NS] Not significant

* Significant (P < 0.05)

Values bearing same superscripts in the same row do not differ significantly

CONCLUSIONS

In conclusion, taking the economical aspect into account, *Chlorella vulgaris* could be safely used in Japanese quail diets, at level of 0.5%, with superior effects on their productive performance.

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